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Virtual Battle Experiments to Investigate Coalition Data Sharing

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9th ICCRTS

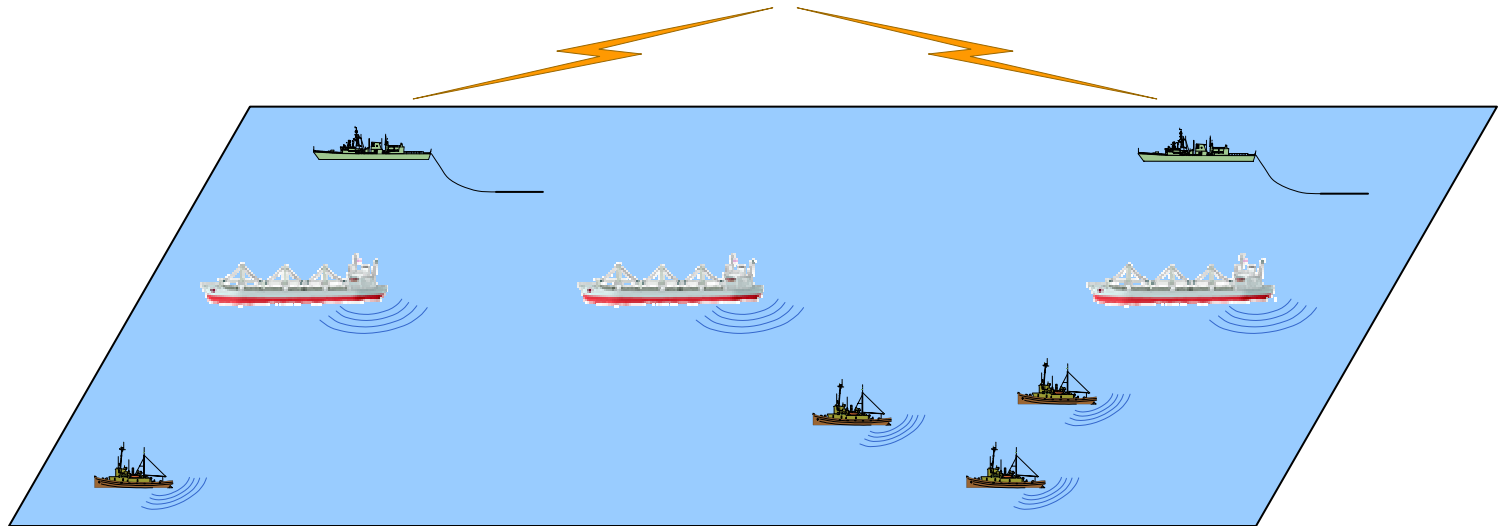
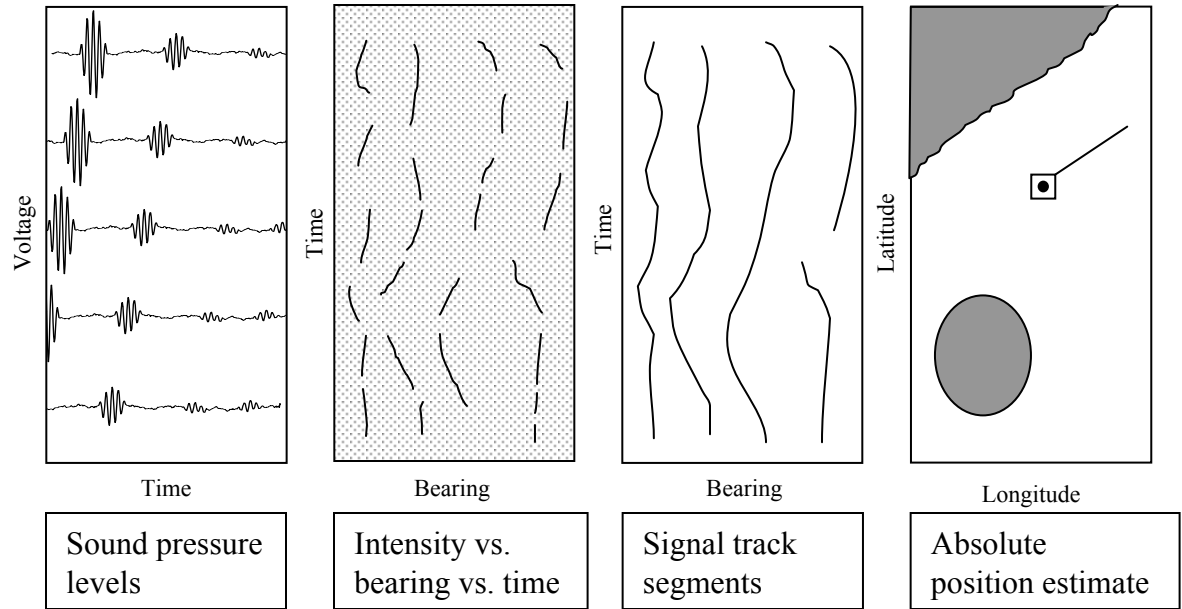
Copenhagen, 14 - 16 September 2004



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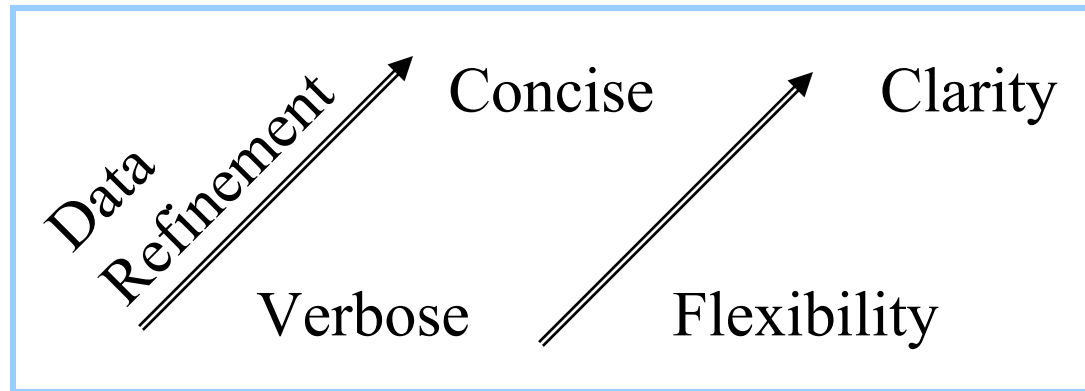
Canada





Networked Underwater Warfare

- How can we make the best use of shared sonar data?



- Effective use of lower-level, lower-density shared information requires time, tools, training, and bandwidth.
- *When is it worthwhile to exchange low-level data?*

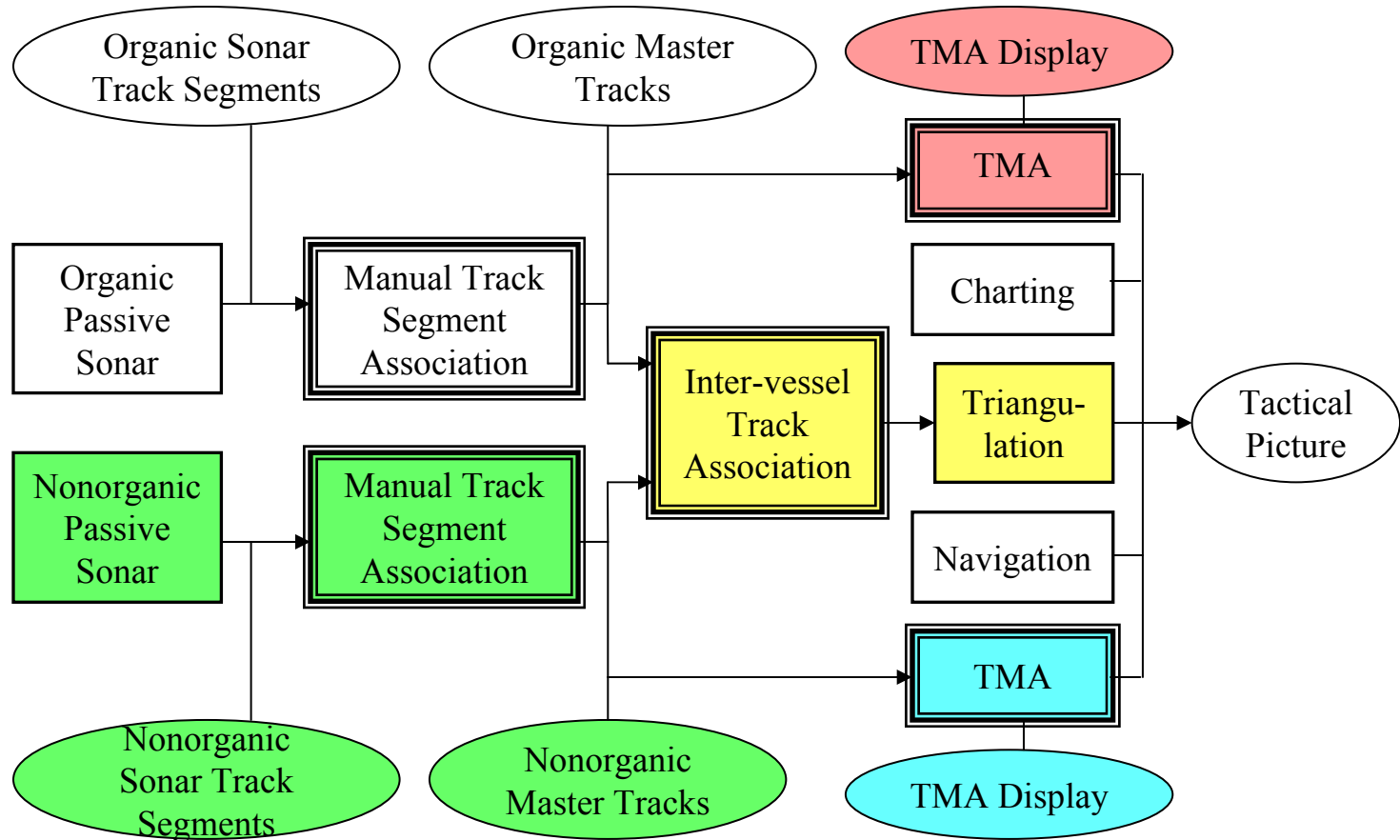


Coalition Sonar Track Sharing (CoaSTS)

- CoaSTS is a series of *controlled, repeatable, human-in-the-loop experiment* configurations to investigate the influence of shared sonar track data at various levels of development.
- It is a VMSA/HLA-based simulation that requires a human operator to use passive sonar tracks to monitor local vessel traffic.
- Compares the results of multiple independent operators running multiple independent sessions of a limited number of scenarios to produce *statistically relevant results*.

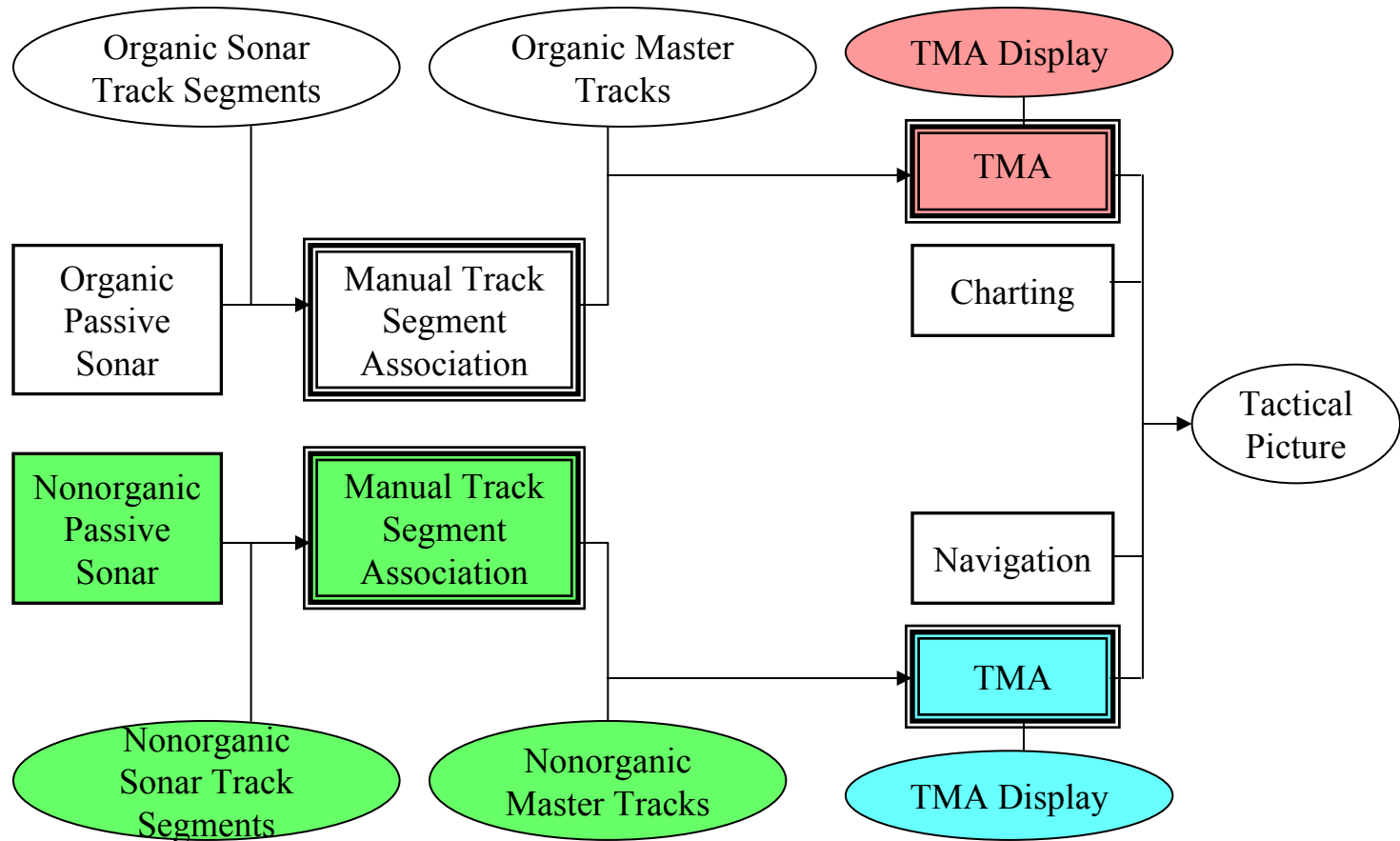


Coalition Sonar Track Sharing





Coalition Sonar Track Sharing



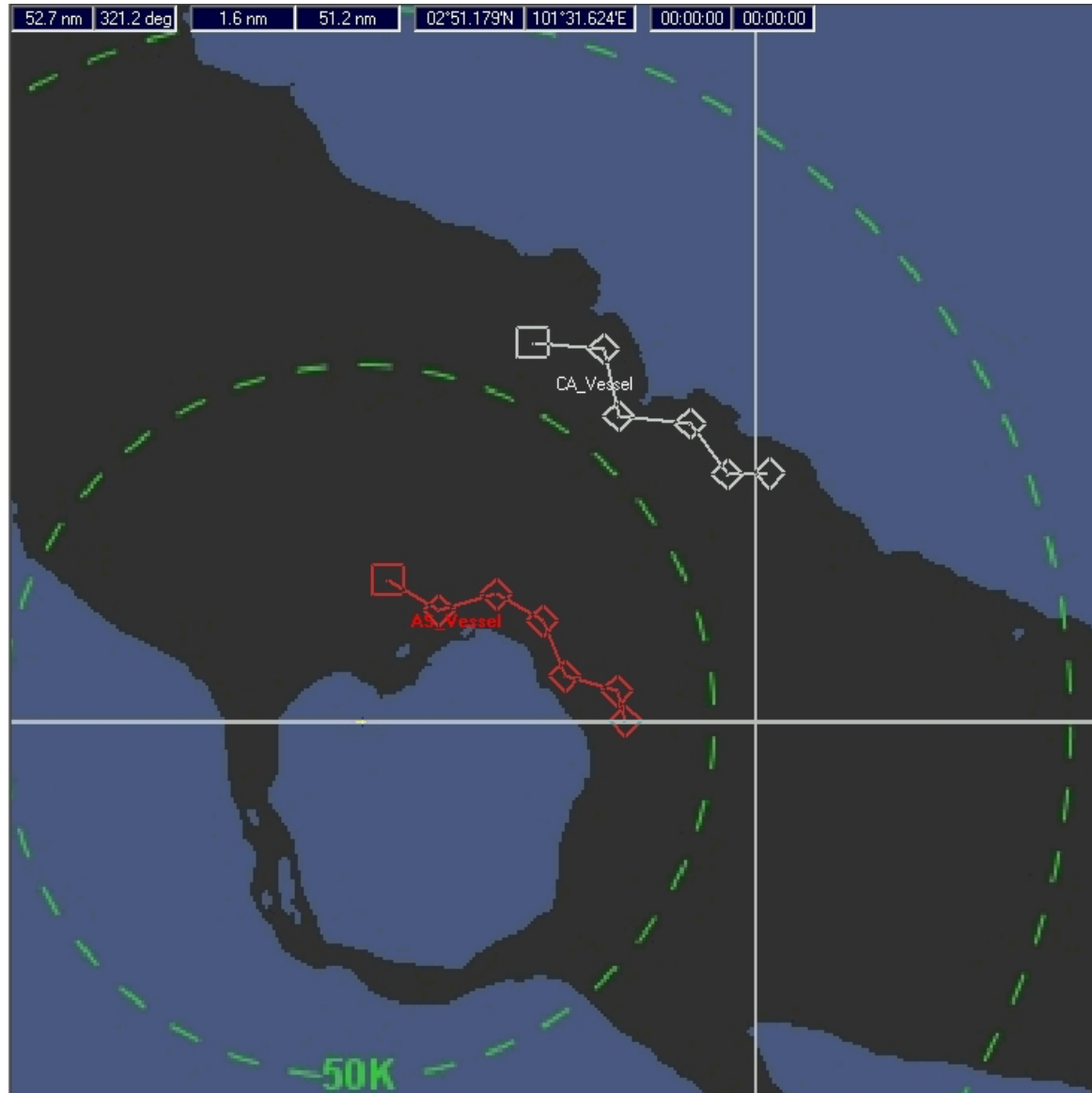


VBE CA-1 Objectives

- VBE CA-1 uses the first two experimental configurations, with neither triangulation nor TMA, to address the following objectives:
- **Hypothesis Testing:** Sonar track sharing among coalition partners is beneficial even when the data can only be shared as an independent display.
- **Discovery:** What is the rationale used by a sonar operator to make association and disassociation decisions?



VBE CA-1 Scenario





VBE CA-1 Track Display

Horizon 3 - HEADING 044° COURSE 044° SPEED 14.9 kts DEPTH 0 m LATITUDE 10°3'44" N LONGITUDE 123°22'30" E

FUSED
SONAR 175 204 203 36 45 259 1 152 5 3 44 125 4 3 253 180 1 254 231 221

NOTES 30

MINS 30 60 90

Platform
Owship

HLA: Sim started

Menu **Active Fusion** **NUC: Annotation Generator** **Datum Plugin** **Cursor Position**

HORIZON 3 v2.1.5
MAP
TBRG
VBE
About...
Exit

Selected Tracks: Associate Using:
Please select 2+ tracks
Select Tracks **Force Display**

Annotation Text
Annotation Image
Age (seconds)
Associated Track
Bearing (min, max) 180.0 180.0
 Bearing Valid
 Periscope Image
Create

Create New Datum
<new datum>
1. Choose desired datum name.
2. Select "Create New Datum" toggle button.
3. Click on Map to position the new datum.

Time 11:22:21 AM
Bearing 095°
Range 31795 m
Latitude 33862' N
Longitude 12378' E
Listen

Refresh
Full Bearing
Shift 180°



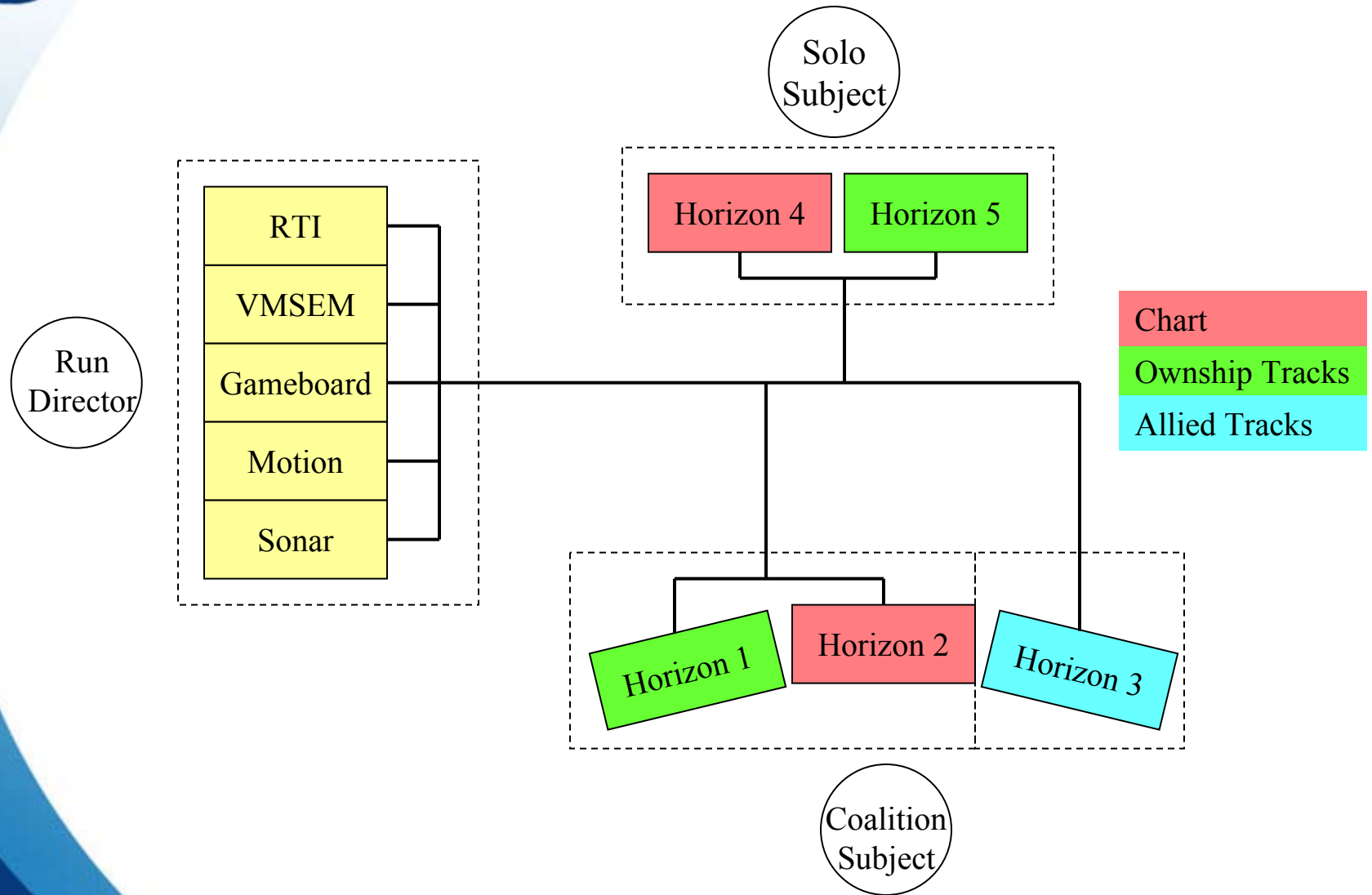
Recording the Decision Rationale

- This query appears whenever the operator makes a (dis)association or decision.
- The 'other' choice opens a text box to record a free-form response of the operator's choice.

The image shows a Windows-style dialog box titled "Enter Reason". The dialog box has a title bar with standard minimize, maximize, and close buttons. The main content area contains the text "Why did you make that choice?" followed by a list of radio button options: "Source Level", "Limited Navigational Waters", "Track Noise Level", "Bearing Continuity", "Operational Constraints", and "other". The "other" option is selected. Below the list is a large, empty text box with a vertical scrollbar on the right side. At the bottom of the dialog box are two buttons: "OK" and "Cancel".



VBE CA-1 Configuration





Findings

- The presence of low-level non-organic data correlated with a *slight increase in Association Correctness* and a *small reduction in the Association Delay*.
 - Correctness = $\frac{\text{number of correct associations}}{\text{total number of associations made}}$
 - Delay = track fusion time – latest track initiation time
- The Decision Rationale test was inconclusive.



Conclusions

- A baseline has been established for the follow-on experiments.
 - More operators will be required for statistical significance.
 - An experimentation infrastructure and procedures have been established.
 - A more accurate sonar simulation is required

Future Work

- The next experiment will include triangulation.

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